 PATENT

IN THE CLAIMS:

1 - 19. (canceled)

20. (new) A manufacturing method of a silicon wafer, in which a silicon wafer that has been sliced from a silicon single crystal is heat-treated in an oxidizing atmosphere, wherein

assuming that a temperature at which said heat treatment is carried out in said oxidizing atmosphere is denoted as T(°C) and an interstitial oxygen concentration is denoted as [Oi] (atoms/cm^3), said manufacturing method of the silicon wafer characterized in that a relation between said temperature T and said interstitial oxygen concentration [Oi] satisfies the following formula:

$[Oi] \leq 2.123\times10^{21}\exp(-1.035/k(T+273))$,

where, said interstitial oxygen concentration is a value measured in accordance with FT-IR method (ASTM F-121, 1979) and the k is the Boltzmann's constant, 8.617×10^{-5}(eV/K).

21. (new) A manufacturing method of a silicon wafer in accordance with claim 20, in which a single crystal doped with phosphorus by a neutron irradiation is used as said silicon single crystal.

22. (new) A manufacturing method of a silicon wafer in accordance with claim 20, in which a single crystal doped with nitrogen by a concentration of 2×10^{13} atoms/cm^3 or more and/or a single crystal doped with carbon by a concentration of 5×10^{16} atoms/cm^3 or more is used as said silicon single crystal.

23. (new) A manufacturing method of a silicon wafer in accordance with claim 21, in which a single crystal doped with nitrogen by a concentration of 2×10^{13} atoms/cm^3 or more and/or a single crystal doped with carbon by a concentration of 5×10^{16} atoms/cm^3 or more is used as said silicon single crystal.

24. (new) A manufacturing method of a silicon wafer in accordance with claim 20, in which the silicon wafer is mirror-polished after said heat treatment in said oxidizing atmosphere.

25. (new) A manufacturing method of a silicon wafer in accordance with claim 21, in which the silicon wafer is mirror-polished after said heat treatment in said oxidizing atmosphere.

26. (new) A manufacturing method of a silicon wafer in accordance with claim 22, in which the silicon wafer is mirror-

polished after said heat treatment in said oxidizing atmosphere.

27. (new) A manufacturing method of a silicon wafer in accordance with claim 23, in which the silicon wafer is mirror-polished after said heat treatment in said oxidizing atmosphere.

28. (new) A manufacturing method of a SOI wafer, in which a SOI wafer is manufactured by using said silicon wafer manufactured by said method as defined in claim 24 for an active layer side wafer.

29. (new) A manufacturing method of a SOI wafer, in which a SOI wafer is manufactured by using said silicon wafer manufactured by said method as defined in claim 25 for an active layer side wafer.

30. (new) A manufacturing method of a SOI wafer, in which a SOI wafer is manufactured by using said silicon wafer manufactured by said method as defined in claim 26 for an active layer side wafer.

31. (new) A manufacturing method of a SOI wafer, in which a

SOI wafer is manufactured by using said silicon wafer manufactured by said method as defined in claim 27 for an active layer side wafer.

32. (new) A manufacturing method of a SOI wafer, in which a buried oxide film is formed by applying a heat treatment to an active layer side silicon wafer in an oxidizing atmosphere, and said active layer side silicon wafer is then bonded to a supporting side wafer with said buried oxide layer interposed therebetween thus to manufacture a bonded SOI wafer, wherein

assuming that a temperature at which said heat treatment is applied to said active layer side silicon wafer in said oxidizing atmosphere is denoted as T(°C) and an interstitial oxygen concentration of said active layer side silicon wafer is denoted as [Oi] (atoms/cm^3), said manufacturing method of the SOI wafer characterized in that a relation between said heat treatment temperature T and said interstitial oxygen concentration [Oi] of said active layer side silicon wafer satisfies the following formula:

$[Oi] \le 2.123 \times 10^{21} \exp(-1.035/k(T+273))$,

where, said interstitial oxygen concentration is a value measured in accordance with FT-IR method (ASTM F-121, 1979) and the k is the

Boltzmann's constant, 8.617×10^{-5}(eV/K).

33. (new) A manufacturing method of a SOI wafer in accordance with claim 32, in which said active layer side silicon wafer is fabricated by using a silicon single crystal doped with phosphorus by neutron irradiation.

34. (new) A manufacturing method of a SOI wafer in accordance with claim 32, in which said active layer side silicon wafer is fabricated by using a silicon single crystal doped with nitrogen by a concentration of 2×10^{13} atoms/cm^3 of more and/or by using a silicon single crystal doped with carbon by a concentration of 5×10^{16} atoms/cm^3 or more.

35. (new) A manufacturing method of a SOI wafer in accordance with claim 33, in which said active layer side silicon wafer is fabricated by using a silicon single crystal doped with nitrogen by a concentration of 2×10^{13} atoms/cm^3 of more and/or by using a silicon single crystal doped with carbon by a concentration of 5×10^{16} atoms/cm^3 or more.

36. (new) A manufacturing method of a SOI wafer, in which an

active layer side silicon wafer is bonded to a supporting side wafer with an insulating film interposed therebetween and then a heat treatment for enhancing a bonding strength is applied to thus bonded wafer in an oxidizing atmosphere to thereby manufacture a bonded SOI wafer, wherein

assuming that a temperature at which said heat treatment for enhancing the bonding strength is carried out in said oxidizing atmosphere is denoted as T(°C) and an interstitial oxygen concentration of said active layer side silicon wafer is denoted as [Oi] (atoms/cm^3), said manufacturing method of the SOI wafer characterized in that a relation between said temperature T and said interstitial oxygen concentration [Oi] satisfies the following formula:

$[Oi] \leq 2.123\times10^{21}\exp(-1.035/k(T+273))$,

where, said interstitial oxygen concentration is a value measured in accordance with FT-IR method (ASTM F-121, 1979) and the k is the Boltzmann's constant, 8.617×10^{-5} (eV/K).

37. (new) A manufacturing method of a SOI wafer in accordance with claim 36, in which said active layer side silicon wafer is fabricated by using a silicon single crystal doped with phosphorus by neutron irradiation.

38. (new) A manufacturing method of a SOI wafer in accordance with claim 36, in which said active layer side silicon wafer is fabricated by using a silicon single crystal doped with nitrogen by a concentration of 2×10^{13} atoms/cm^3 or more and/or by using a silicon single crystal doped with carbon by a concentration of 5×10^{16} atoms/cm^3 or more.

39. (new) A manufacturing method of a SOI wafer in accordance with claim 37, in which said active layer side silicon wafer is fabricated by using a silicon single crystal doped with nitrogen by a concentration of 2×10^{13} atoms/cm^3 or more and/or by using a silicon single crystal doped with carbon by a concentration of 5×10^{16} atoms/cm^3 or more.

40. (new) A manufacturing method of a SOI wafer, comprising the steps of:

fabricating an active layer side silicon wafer by firstly applying an oxidizing heat treatment to a silicon wafer, which satisfies the following formula representing a relation between a heat treatment temperature T and an interstitial oxygen concentration [Oi]:

$[Oi]\leq2.123\times10^{21}\exp(-1.035/k(T+273))$,

where, T(°C) is the temperature at which said heat treatment is carried out in an oxidizing atmosphere, and [Oi] (atoms/cm^3) is the interstitial oxygen concentration in the silicon wafer, wherein said interstitial oxygen concentration is a value measured in accordance with FT-IR method (ASTM F-121, 1979) and the k is the Boltzmann's constant, 8.617×10^{-5} (eV/K), and by secondly removing an oxide film and applying a mirror-polishing;

forming an ion implanted layer in said active layer side silicon wafer by forming an oxide film on said active layer side silicon wafer, and ion-implanting via said oxide film;

subsequently, forming a bonded wafer by bonding said active layer side silicon wafer to a supporting side wafer with said oxide film interposed therebetween; and

then, separating a part of said active layer side silicon wafer from a boundary defined by said ion implanted layer by holding said bonded wafer at a predetermined temperature to thereby apply a heat treatment thereto.

41. (new) A manufacturing method of a SOI wafer in accordance with claim 40, in which a surface of the separated active layer side wafer is mirror-polished so that it can be used repeatedly as a substrate for forming a new active layer of the SOI wafer.

42. (new) A manufacturing method of a SOI wafer in accordance with claim 40, in which said active layer side silicon wafer is fabricated by using a silicon single crystal doped with phosphorus by neutron irradiation.

43. (new) A manufacturing method of a SOI wafer in accordance with claim 41, in which said active layer side silicon wafer is fabricated by using a silicon single crystal doped with phosphorus by neutron irradiation.

44. (new) A manufacturing method of a SOI wafer in accordance with claim 40, in which said active layer side silicon wafer is fabricated by using a silicon single crystal doped with nitrogen by a concentration of 2×10^{13} atoms/cm^3 or more and/or by using a silicon single crystal doped with carbon by a concentration of 5×10^{16} atoms/cm^3 or more.

45. (new) A manufacturing method of a SOI wafer in accordance with claim 41, in which said active layer side silicon wafer is fabricated by using a silicon single crystal doped with nitrogen by a concentration of 2×10^{13} atoms/cm^3 or more and/or by using a silicon single crystal doped with carbon by a concentration of

5×10^{16} atoms/cm^3 or more.

46. (new) A manufacturing method of a SOI wafer in accordance with claim 42, in which said active layer side silicon wafer is fabricated by using a silicon single crystal doped with nitrogen by a concentration of 2×10^{13} atoms/cm^3 or more and/or by using a silicon single crystal doped with carbon by a concentration of 5×10^{16} atoms/cm^3 or more.

47. (new) A manufacturing method of a SOI wafer in accordance with claim 43, in which said active layer side silicon wafer is fabricated by using a silicon single crystal doped with nitrogen by a concentration of 2×10^{13} atoms/cm^3 or more and/or by using a silicon single crystal doped with carbon by a concentration of 5×10^{16} atoms/cm^3 or more.